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19970028022 NASA Langley Research Center, Hampton, VA USA

Systems Challenges for Hypersonic Vehicles

Hunt, James L., NASA Langley Research Center, USA; Laruelle, Gerard, Aerospatiale, France; Wagner, Alain, Aerospatiale, France; 1997; 22p; In English; Future Aerospace Technology in the Service of the Alliance, 14-16 Apr. 1997, Palaiseau, France; Sponsored by Advisory Group for Aerospace Research and Development, France

Report No.(s): NASA-TM-112908; NAS 1.15:112908; AGARD-Paper-C37; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This paper examines the system challenges posed by fully reusable hypersonic cruise airplanes and access to space vehicles. Hydrocarbon and hydrogen fueled airplanes are considered with cruise speeds of Mach 5 and 10, respectively. The access to space matrix is examined. Airbreathing and rocket powered, single- and two-stage vehicles are considered. Reference vehicle architectures are presented. Major systems/subsystems challenges are described. Advanced, enhancing systems concepts as well as common system technologies are discussed.

Author

Hypersonic Vehicles; Hypersonics; Hydrogen Fuels; Hydrocarbon Fuels; Air Breathing Engines; Rocket Engines

19970029162 Advisory Group for Aerospace Research and Development, Fluid Dynamics Panel, Neuilly-Sur-Seine, France
Aerodynamics of Wind Tunnel Circuits and their Components *L'Aerodynamique des Circuits des Souffleries et de Leurs Composants*

Aerodynamics of Wind Tunnel Circuits and their Components; Jun. 1997; 446p; In English; 79th; Fluid Dynamics Panel Symposium, 30 Sep. - 3 Oct. 1996, Moscow, Russia; Sponsored by Advisory Group for Aerospace Research and Development, France; Also announced as 19970029163 through 19970029194

Report No.(s): AGARD-CP-585; ISBN-92-836-0042-8; Copyright Waived; Avail: CASI; A19, Hardcopy; A04, Microfiche

The aim of this Symposium was to gather and review both current knowledge and ongoing research on the aerodynamic design and evaluation of ground test facilities, focusing primarily on wind tunnels, in order to provide to the designers of experimental facilities an opportunity to exchange information, ideas, and visions. Shrinking budgets for new facilities have led to fewer facilities being developed and longer development times, which have in turn led to less opportunity for advances in the state-of-the-art and for the retention of the experts needed for the design of good experimental facilities. The normal overriding user objectives, when conducting almost any kind of wind-tunnel test, are obtaining reliable and meaningful data in a timely and cost-effective manner. Principal requirements for obtaining reliable and meaningful data are an adequate Reynolds number, representative or satisfactory tunnel flow quality, and the avoidance of tunnel wall and support system effects. Factors which are important in satisfying the timeliness and cost effectiveness requirements include minimizing the time required for model installation and configuration changes, utilization of efficient data gathering systems, and the ability to use rapid techniques to account for tunnel wall and support system interference effects. Since the aerodynamic design of wind-tunnel circuits has a fundamental first

order effect on tunnel flow quality, tunnel wall and support interference effects, and on tunnel construction costs, the adequacy of the circuit design is of crucial importance in meeting the user's objectives. It should be noted that this was the first AGARD Symposium held in Russia, and that 50% of the papers were by Russian authors. Much information was shared by those who are involved in developing, operating, and utilizing experimental ground test facilities.

Author

Aerodynamic Interference; Circuits; Wind Tunnel Tests; Support Systems; Support Interference; Reynolds Number

19970029334 Advisory Group for Aerospace Research and Development, Structures and Materials Panel, Neuilly-Sur-Seine, France

Loads and Requirements for Military Aircraft *Les Charges et les Specifications des Avions Militaires*

Feb. 1997; 176p; In English; In French; 83rd; AGARD Structures and Materials Panel, 4-5 Sep. 1996, Florence, Italy; Also announced as 19970029335 through 19970029346

Report No.(s): AGARD-R-815; ISBN-92-836-0037-1; Copyright Waived; Avail: CASI; A09, Hardcopy; A02, Microfiche

Since the beginning of aircraft design and certification, loads and loads-related requirements have continued to evolve, while the initial conservative assumptions related to safety factors have remained essentially the same over the years. The technology and analysis tools have also evolved substantially in several areas: for example the increased use of computational/experimental methods in the areas of maneuvering loads; the characterization of buffet; the increased use of stochastic methods for gust loads; and the improved knowledge of fatigue life impact on design. On the other hand, the quest for lighter and higher performance aircraft led to the development of new technologies such as Electronic Flight Control Systems (EFCS) and thrust vectoring systems. With the increased use of these technologies and the improved quantification of factors influencing loads, the initial concept of safety factors and also some of the bases of military standards for military aircraft needed to be re-visited. It was observed in the Workshop that there was not much advantage in trying to reduce the safety factors for a new aircraft but that it might be effective to do so for an aircraft modification after a change of role, for instance. Reserves were also expressed as to the danger of optimizing a design for an initial use. It was considered advisable to remain conservative in order to accommodate changes in role during the life of an aircraft, especially a fighter aircraft. The effects of failures of EFCS on loads envelopes were also presented, showing that in certain cases an aircraft designed according to a functional EFCS could exceed the design load envelope when a failure of EFCS occurred, thus arguing for a certain conservatism in design. It was concluded, that some level of conservatism was still required but that new criteria and methods should be investigated in order to propose standards for future aircraft design.

Author

Aircraft Design; Fighter Aircraft; Loads (Forces); Structural Analysis; Certification; Flight Control; Thrust Vector Control

19970029347 Advisory Group for Aerospace Research and Development, Mission Systems Panel, Neuilly-Sur-Seine, France

Advanced Architectures for Aerospace Mission Systems *Architectures Futures pour l'Avionique de Gestion de Mission*

Jul. 1997; 312p; In English; In French; 6th, 14-17 Oct. 1996, Istanbul, Turkey; Also announced as 19970029348 through 19970029377; Original contains color illustrations

Report No.(s): AGARD-CP-581; ISBN-92-836-0044-4; Copyright Waived; Avail: CASI; A14, Hardcopy; A03, Microfiche

This volume contains the Technical Evaluation Report and the 30 unclassified papers, presented at the Mission Systems Panel Symposium held in Istanbul, Turkey, 14-17 October 1996. The papers presented covered the following headings: Invited Papers; Military Applications of Civil Systems; Communications (Systems); Communications (Technology); Surveillance (Reconnaissance); Surveillance (Meteorology); Surveillance (Early Warning); Information Extraction; Vehicle Management; Future Systems and Panel Discussion.

Author

Aerospace Environments; Meteorology; Military Technology; Reconnaissance; Surveillance

19970030248 Advisory Group for Aerospace Research and Development, Mission Systems Panel, Neuilly-Sur-Seine, France

Advances in Soft-Computing Technologies and Application in Mission Systems *Les Avances des Technologies du Calcul Symbolique et les Applications aux Systemes Numeriques de Gestion de la Mission*

Advances in Soft-Computing Technologies and Application in Mission Systems; Sep. 1997; 112p; In English, 17-18 Sep. 1997, North York, Amsterdam, Madrid, Ankara, Canada, Netherlands, Spain, Turkey; Also announced as 19970030249 through 19970030255

Report No.(s): AGARD-LS-210; ISBN-92-836-1061-X; Copyright Waived; Avail: CASI; A06, Hardcopy; A02, Microfiche

Contains the papers presented at a Lecture Series on 'Soft Computing' technologies. Soft computing addresses the pervasive imprecision of the real world by consideration of the tolerances for imprecision, uncertainty and partial truth to achieve tractable, robust and low-cost solutions for complex problems. Topics covered include soft computing for computation and machine intelli-

gence, neural networks, fuzzy logic, inference and fuzzy control, hybrid architectures for intelligent and learning inference systems, and applications to target tracking and acquisition and the reconfiguration of damaged aircraft. The Lecture Series was sponsored by the Mission Systems Panel of NATO's Advisory Group for Aerospace Research and Development (AGARD).

Author

Artificial Intelligence; Software Engineering; Precision; Mathematical Models; Fuzzy Sets; Neural Nets; Algorithms

19970034746 Advisory Group for Aerospace Research and Development, Propulsion and Energetics Panel, Neuilly-Sur-Seine, France

Service Life of Solid Propellant Systems *La Duree de Vie des Systemes a Ergols Solides*

May 1997; 494p; In English; In French; 87th, 10-14 May 1996, Athens, Greece; Also announced as 19970034747 through 19970034788; Original contains color illustrations

Report No.(s): AGARD-CP-586; ISBN-92-836-0036-3; Copyright Waived; Avail: CASI; A21, Hardcopy; A04, Microfiche

The Propulsion and Energetics Panel Symposium on Service Life of Solid Propellant Motors was held from 10-14 May 1996, in Athens, Greece. It dealt with the methods of extending and predicting service life of solid propellant systems for rockets, gas generators and guns. It also dealt with shelf life under varying conditions. This defence-specific symposium was aimed at improving system reliability, safety and cost. There were five sessions (43 papers) and a keynote address: Chemical and Physical Aging Mechanisms; Non-Destructive Test Methods; Gun Propellants; Methodologies and Techniques for Determining Service Life; Application of the Service Life Methodology and Techniques to Rocket Motor Systems.

Author

Service Life; Solid Propellant Rocket Engines; Gun Propellants; Storage Stability; Reliability; Aging (Materials); Predictions; Solid Propellants; Nondestructive Tests

19970034906 Advisory Group for Aerospace Research and Development, Propulsion and Energetics Panel, Neuilly-Sur-Seine, France

Aircraft Fire Safety *La Securite Incendie des Aeronefs*

Sep. 1997; 340p; In English; In French; 88th, 14-17 Oct. 1996, Dresden, Germany; Also announced as 19970034907 through 19970034937; Original contains color illustrations

Report No.(s): AGARD-CP-587; ISBN-92-836-0046-0; Copyright Waived; Avail: CASI; A15, Hardcopy; A03, Microfiche

The Propulsion and Energetics Panel Symposium on Aircraft Fire Safety was held in Dresden, Germany from 14-17 October 1996. It dealt with military and civil aspects of fire safety, covering combat-induced damage and technical sources of fire, fire prevention, fire fighting, fire damage control, and fire damage to humans and equipment. Environmental issues including Halon replacement were addressed. There were 7 sessions (37 papers) and a keynote address: Aircraft Fire Safety; Fires and Fire Handling; On-board Fire Extinguishing Systems; Certification and Testing; Materials and Structure Design for Fire Safety; Aeromedical Aspects Including Smoke Toxicity; and Passenger Protection and Behaviour.

Author

Aircraft Safety; Fire Damage; Conferences; Passenger Aircraft; Military Aircraft; Fire Prevention; Fires; Halogen Compounds; Aerospace Medicine; Structural Design; Passengers

19970036380 Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine, France

Aerospace 2020, Volume 2 *Aeronautique et Espace a l'Horizon 2020, Volume 2*

Sep. 1997; 196p; In English; Original contains color illustrations

Report No.(s): AGARD-AR-360-Vol-2; ISBN-92-836-1058-X; Copyright Waived; Avail: CASI; A09, Hardcopy; A03, Microfiche

Volume 2, the main volume, of the report of the NATO Advisory Group for Aerospace Research and Development (AGARD) study: 'Aerospace 2020'. This study explored the most advanced technologies, relevant to aerospace, being researched and developed in laboratories today. The study focused on the most promising current technologies and the organizational and tactical consequences they will have at the field and system levels, over the course of the next 25 years. Topics include: a discussion of the impact of proliferation, human-machine interaction, synthetic environments, directed-energy weapons, information technologies, unmanned tactical aircraft, suborbital launchers, hypersonic missiles, and a discussion of affordability issues. Technologies are assessed from the viewpoints of both potential capabilities and threats. Observations and recommendations are presented.

Author

Aerospace Engineering; Forecasting; Weapon Systems; Hypersonics; Human Factors Engineering; Man Machine Systems; Pilotless Aircraft

19970037359 Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine, France

Active Combustion Control for Propulsion Systems *Le Controle Actif de la Combustion Pour les Systemes de Propulsion*

Schadow, K., Naval Air Warfare Center, USA; Yang, V., Pennsylvania State Univ., USA; Culick, F., California Inst. of Tech., USA; Rosfjord, T., United Technologies Corp., USA; Sturgess, G., Innovative Scientific Solutions, Inc., USA; Zinn, B., Georgia Inst. of Tech., USA; Sep. 1997; 52p; In English; In French; Propulsion and Energetics Panel, 6-9 May 1996, Athens, Greece
Report No.(s): AGARD-R-820; ISBN-92-836-1060-1; Copyright Waived; Avail: CASI; A04, Hardcopy; A01, Microfiche

Active combustion control is one of the most promising approaches to further optimize the size/weight/power relationship in rockets, ramjets, afterburners, aero-engines, and marine propulsion. A workshop was organized in Athens in spring 1996 under the sponsorship of the AGARD Propulsion and Energetics Panel. It covered the existing knowledge, and further possible strategies for military equipment were discussed within the NATO nations. Further activities are planned.

AIAA

Combustion Control; Active Control; Propulsion System Performance; Propulsion System Configurations; Afterburning; Aircraft Engines; Marine Propulsion; Ramjet Engines

19970041535 Advisory Group for Aerospace Research and Development, Structures and Materials Panel, Neuilly-Sur-Seine, France

Aging Combat Aircraft Fleets: Long Term Applications *Les Consequences a Long Terme du Vieillissement des Flottes d'A-
vions de Combat*

Oct. 1996; 236p; In English; Aging Combat Aircraft Fleets: Long Term Applications, 7-8 Oct. 1996, Madrid, Pomezia, Atlanta, GA, Brussels, Spain, Italy, USA, Belgium; Also announced as 19970041536 through 19970041547

Report No.(s): AGARD-LS-206; ISBN 92-836-1044-X; Copyright Waived; Avail: CASI; A11, Hardcopy; A03, Microfiche

This Lecture Series covers systems update and structural airworthiness aspects of aging, fixed-wing aircraft. It highlights the aspect of retrofit/rejuvenation of aging aircraft through presentations relating to three front-line combat aircraft in NATO's inventory. The presentations describe the implementation strategies and ways to improve the ability of an airframe to accommodate new systems to meet present day mission requirements. Technical issues pertaining to structural safety, maintenance management, and proactive rehabilitation/retrofit schemes are also discussed. It provides technical information to fleet operators and managers to assist them to better manage aging aircraft fleets and be able to deal with aging related problems as they arise. It also targets industry personnel responsible for upgrading the capabilities of combat aircraft, maintenance personnel at air logistics centers, and specialists involved with the design of repairs and prescription of inspection methods. "Aging aircraft" has several connotations, amongst them technological obsolescence, performance upgrading, changing mission requirements unanticipated during design specification and development, the specter of runaway maintenance costs, decreased safety, impairment of fleet readiness, and unavailability of home depot facilities.

Author

Aging (Materials); Fighter Aircraft; Airframes; Safety Management; Aircraft Maintenance; Aircraft Reliability; Lectures; Specifications; Mission Planning; Aircraft Configurations